

## C L A I M S

1. A digital signal offset adjusting apparatus comprising:

an input terminal to which an input digital signal having a wideband frequency characteristic including a low frequency band, a direct current component, and a high frequency band is input;

a direct current voltage generator which outputs a desired direct current bias voltage;

an output terminal to output an output digital signal obtained by applying the direct current bias voltage output from the direct current voltage generator to the low frequency band, the direct current component, and the high frequency band of the input digital signal input to the input terminal;

a capacitor which is connected between the input terminal and the output terminal and which causes the output terminal to pass through the high frequency band of the input digital signal input to the input terminal;

a first coil, one end of which is connected to the input terminal, and which passes the low frequency band and the direct current component of the input digital signal to another end;

a second coil, one end of which is connected to the output terminal;

a operational amplifier, a first input end of

which is connected to the other end of the first coil,  
a second input end of which is connected to the direct  
current voltage generator, an output end of which is  
connected to another end of the second coil, and which  
5 outputs to the output terminal via the other end of the  
second coil from the output end, the low frequency band  
of the input digital signal passed to the other end of  
the first coil input to the first and second input ends  
and a composite signal obtained by combining the direct  
10 current component and the direct current bias voltage  
output from the direct current voltage generator; and  
a frequency characteristic compensating circuit  
connected between a reference electrical potential  
point and the second input end of the operational  
15 amplifier or between the second input end and the  
output end, the compensating circuit being adopted to  
compensate for a frequency characteristic so that a  
gain of the operational amplifier increases with a  
component having a higher frequency from among the low  
20 frequency bands of the input digital signal passed to  
the other end of the first coil.

2. The digital signal offset adjusting apparatus  
according to claim 1, characterized in that, when the  
first and second input ends of the operational  
25 amplifier are a non-inverted input end and an inverted  
input end, respectively,

an input matching resistor having a predetermined

value is connected between the reference electrical potential point and the non-inverted input end of the operational amplifier,

5           a feedback resistor is connected between the output end and the inverted input end of the operational amplifier,

10          an output matching resistor having a predetermined value is connected between the output end of the operational amplifier and the other end of the second coil, and

15          a direct current inputting resistor having a predetermined value is connected between the inverted input end of the operational amplifier and the direct current voltage generator,

20          whereby a subtracted and combined signal obtained by subtracting and combining by the operational amplifier the low frequency band and the direct current component of the input digital signal passed to the other end of the first coil input to the inverted input end of the operational amplifier and the direct current bias voltage from the direct current voltage generator input to the non-inverted input end of the operational amplifier is output to the output terminal via the other end of the second coil from the output end of the operational amplifier.

3. The digital signal offset adjusting apparatus according to claim 2, characterized in that the direct

current inputting resistor connected between the inverted input end of the operational amplifier and the direct current voltage generator has a value equal to a value of the feedback resistor connected between the output end of the operational amplifier and the inverted input end as the predetermined value, and  
5 the frequency characteristic compensating circuit is composed of a capacitor and a resistor connected in serial between the inverted input end and the reference electronic potential point of the operational amplifier.  
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4. The digital signal offset adjusting apparatus according to claim 2, characterized in that the frequency characteristic compensating circuit is composed of a serial circuit of a coil and a resistor connected between the output end and the inverted input end of the operational amplifier, and  
15 the direct current inputting resistor connected between the inverted input end of the operational amplifier and the direct current voltage generator has a value equal to a parallel combined resistance value of the feedback resistor of the operational amplifier and the resistor of the frequency characteristic compensating circuit as the predetermined value.  
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25 5. The digital signal offset adjusting apparatus according to claim 4, characterized in that the frequency characteristic compensating circuit is

compatible with the feedback resistor connected between the output end and the inverted input end of the operational amplifier by means of the resistor of the frequency characteristic compensating circuit, and is composed of a coil connected in series between the resistor compatible with the feedback resistor and the inverted input end, and

a resistance value of the resistor of the frequency characteristic compensating circuit  
compatible with the feedback resistor of the operational amplifier is set to be equal to a resistance value of the direct current inputting resistor from the direct current voltage generator.

6. A digital signal offset adjusting apparatus comprising:

an input terminal to which an input digital signal having a wideband frequency characteristic including a low frequency band, a direct current component, and a high frequency band is input;

a direct current voltage generator which outputs a desired direct current bias voltage;

an output terminal to output an output digital signal obtained by applying the direct current bias voltage output from the direct current voltage

generator to the low frequency band, the direct current component, and the high frequency band of the input digital signal input to the input terminal;

a capacitor which is connected between the input terminal and the output terminal and which causes the output terminal to pass through the high frequency band of the input digital signal input to the input  
5 terminal;

a first coil whose one end is connected to the input terminal, and which passes the low frequency band and the direct current component of the input digital signal to another end;

10 a second coil whose one end is connected to the output terminal;

a first operational amplifier, a first input end of which is connected to the other end of the first coil, a second input end of which is connected to a  
15 reference electrical potential point, and which outputs from an output end a first inverted and amplified signal obtained by inverting and amplifying the low frequency band and the direct current component of the input digital signal passed to the other end of the  
20 first coil;

a second operational amplifier, a first input end of which is connected to the direct current voltage generator, a second input end of which is connected to the reference electrical potential point, and which  
25 outputs from an output end a second inverted and amplified signal obtained by inverting and amplifying the direct current bias voltage output from the direct

current voltage generator;

a third operational amplifier, a first input end of which is connected in common to each of the output ends of the first and second operational amplifiers, a  
5 second input end of which is connected to the reference electrical potential point, and which inverts and amplifies a combined signal obtained by combining the first and second inverted and amplified signals and outputs the inverted and amplified signal to the other  
10 end of the second coil; and

first and second frequency characteristic compensating circuits connected between the reference electrical potential point and each of the first input end of the first and third operational amplifiers or between each of the first input end and the output end of the first and third operational amplifiers, the first and second frequency characteristic compensating circuits being adopted to compensate for a frequency characteristic so that a gain of each of the first and  
15 third operational amplifiers increases with a component having a higher frequency from among the low frequency bands of the input digital signal passed to the other end of the first coil.

7. The digital signal offset adjusting apparatus according to claim 6, characterized in that, when the first and second input ends of the first to third operational amplifiers are an inverted input end and a  
25

non-inverted input end, respectively,

each of the non-inverted input ends of the first to third operational amplifiers is connected to the reference electrical potential point,

5 an input matching resistor having a predetermined value is connected between the inverted input end and the reference electrical potential point of the first operational amplifier,

10 first to third feedback resistors are connected, respectively, between the output end and the inverted input end of each of the first to third operational amplifiers,

15 a direct current inputting resistor having a predetermined value is connected between the inverted input end of the second operational amplifier and the direct current voltage generator,

20 first and second output matching resistors each having a predetermined value are connected, respectively, between the output end of each of the first and second operational amplifiers and the inverted input end of the third operational amplifier, and

25 a third output matching resistor having the predetermined value is connected between the output end of the third operational amplifier and the other end of the second coil,

whereby an added and combined signal obtained by

adding and combining the first and second inverted and amplified signals output from each of the output ends of the first and second operational amplifiers is output to the output terminal via the other end of the  
5 second coil from the output end of the third operational amplifier which inverts and amplifies the added and combined signal.

8. The digital signal offset adjusting apparatus according to claim 7, characterized in that the direct  
10 current inputting resistor connected between the inverted input end of the second operational amplifier and the direct current voltage generator has a value equal to a value of the second feedback resistor connected between the output end and the inverted input  
15 end of the second operational amplifier as the predetermined value, and

the first and second frequency characteristic compensating circuits are composed of a capacitor and a resistor connected in series, respectively, between the reference electrical potential point and each of the inverted input end of the first and third operational  
20 amplifiers.

9. The digital offset adjusting apparatus according to claim 7, characterized in that the direct  
25 current inputting resistor connected between the inverted input end of the second operational amplifier and the direct current voltage generator has a value

equal to a value of the second feedback resistor connected between the output end and the inverted input end of the second operational amplifier as the predetermined value, and

5           the first and second frequency characteristic compensating circuits are composed of a serial circuit of a coil and a resistor connected between each of the output end and the inverted input end of the first and third operational amplifiers, respectively.

10          10. The digital offset adjusting apparatus according to claim 9, characterized in that the first and second frequency characteristic compensating circuits are compatible with the first and third feedback resistors connected between the output end and the inverted input end of each of the first and third operational amplifiers by a resistor of each of the first and second frequency characteristic compensating circuits, respectively, and are composed of a coil connected in series between each of the resistors .  
15          compatible with the first and third feedback resistors and each of the inverted input ends of the first and third operational amplifiers.

20          20. A pulse pattern generator comprising:  
                  a digital signal output section which outputs a

25          digital signal having a wideband frequency characteristic including a low frequency band, a direct current component, and a high frequency band, the

digital signal being of a desired pulse pattern including a data pattern such that identical bit data are continuous; and

5           a digital signal offset adjusting apparatus connected to the digital signal output section,

              wherein the digital signal offset adjusting apparatus comprises:

10          an input terminal to which a digital signal of a desired pulse pattern having a wideband frequency characteristic including the low frequency band, the direct current component, and the high frequency band output from the digital signal output section is input as an input digital signal;

15          a direct current voltage generator which outputs a desired direct current bias voltage;

              an output terminal to output an output digital signal obtained by applying the direct current bias voltage output from the direct current voltage generator to the low frequency band, the direct current component, and the high frequency band of the input digital signal input to the input terminal;

20          a capacitor which is connected between the input terminal and the output terminal, and which causes the output terminal to pass through the high frequency band of the input digital signal input to the input terminal;

              a first coil, one end of which is connected to the

input terminal, and which passes the low frequency band and the direct current component of the input digital signal to another end;

5           a second coil, one end of which is connected to the output terminal;

a operational amplifier, a first input end of which is connected to the other end of the first coil, a second input end of which is connected to the direct current voltage generator, an output end of which is  
10          connected to another end of the second coil, and which outputs to the output terminal via the other end of the second coil from the output end, the low frequency band of the input digital signal passed to the other end of the first coil input to the first and second input ends  
15          and a composite signal obtained by combining the direct current component and the direct current bias voltage output from the direct current voltage generator; and

20          a frequency characteristic compensating circuit connected between a reference electrical potential point and the second input end of the operational amplifier or between the second input end and the output end, the compensating circuit being adopted to compensate for a frequency characteristic so that a gain of the operational amplifier increases with a  
25          component having a higher frequency from among the low frequency bands of the input digital signal passed to the other end of the first coil.

12. The pulse pattern generator according to  
claim 11, characterized in that, when the first and  
second input ends of the operational amplifier of the  
digital signal offset adjusting apparatus are a non-  
5 inverted input end and an inverted input end,  
respectively,

an input matching resistor having a predetermined  
value is connected between the reference electrical  
potential point and the non-inverted input end of the  
10 operational amplifier,

10 a feedback resistor is connected between the  
output end and the inverted input end of the  
operational amplifier,

15 an output matching resistor having a predetermined  
value is connected between the output end of the  
operational amplifier and the other end of the second  
coil, and

20 a direct current inputting resistor having a  
predetermined value is connected between the inverted  
input end of the operational amplifier and the direct  
current voltage generator,

25 whereby a subtracted and combined signal obtained  
by subtracting and combining by the operational  
amplifier the low frequency band and the direct current  
component of the input digital signal passed to the  
other end of the first coil input to the inverted input  
end of the operational amplifier and the direct current

bias voltage from the direct current voltage generator input to the non-inverted input end of the operational amplifier is output to the output terminal via the other end of the second coil from the output end of the operational amplifier.

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13. The pulse pattern generator according to claim 12, characterized in that the direct current inputting resistor connected between the inverted input end of the operational amplifier and the direct current voltage generator has a value equal to a value of the feedback resistor connected between the output end of the operational amplifier and the inverted input end as the predetermined value, and

15

the frequency characteristic compensating circuit is composed of a capacitor and a resistor connected in serial between the inverted input end and the reference electronic potential point of the operational amplifier.

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14. The pulse pattern generator according to claim 12, characterized in that the frequency characteristic compensating circuit is composed of a serial circuit of a coil and a resistor connected between the output end and the inverted input end of the operational amplifier, and

25

the direct current inputting resistor connected between the inverted input end of the operational amplifier and the direct current voltage generator has

a value equal to a parallel combined resistance value of the feedback resistor of the operational amplifier and the resistor of the frequency characteristic compensating circuit as the predetermined value.

5        15. The pulse pattern generator according to claim 14, characterized in that the frequency characteristic compensating circuit is compatible with the feedback resistor connected between the output end and the inverted input end of the operational amplifier  
10      by means of the resistor of the frequency characteristic compensating circuit, and is composed of a coil connected in series between the resistor compatible with the feedback resistor and the inverted input end, and

15      a resistance value of the resistor of the frequency characteristic compensating circuit compatible with the feedback resistor of the operational amplifier is set to be equal to a resistance value of the direct current inputting resistor from the direct current voltage generator.  
20

25      16. A pulse pattern generator comprising:  
            a digital signal output section which outputs a digital signal having a wideband frequency characteristic including a low frequency band, a direct current component, and a high frequency band, the digital signal being of a desired pulse pattern including a data pattern such that identical bit data

are continuous; and

a digital signal offset adjusting apparatus connected to the digital signal output section, wherein the digital signal offset adjusting apparatus comprises:

an input terminal to which a digital signal of a desired pulse pattern having a wideband frequency characteristic including the low frequency band, the direct current component, and the high frequency band  
10 output from the digital signal output section is input as an input digital signal;

a direct current voltage generator which outputs a desired direct current bias voltage;

15 an output terminal to output an output digital signal obtained by applying the direct current bias voltage output from the direct current voltage generator to the low frequency band, the direct current component, and the high frequency band of the input digital signal input to the input terminal;

20 a capacitor which is connected between the input terminal and the output terminal, and which causes the output terminal to pass through the high frequency band of the input digital signal input to the input terminal;

25 a first coil, one end of which is connected to the input terminal, and which passes the low frequency band and the direct current component of the input digital

signal to another end;

a second coil, one end of which is connected to the output terminal;

5 a first operational amplifier, a first input end of which is connected to the other end of the first coil, a second input end of which is connected to a reference electrical potential point, and which outputs from an output end a first inverted and amplified signal obtained by inverting and amplifying the low  
10 frequency band and the direct current component of the input digital signal passed to the other end of the first coil;

15 a second operational amplifier, a first input end of which is connected to the direct current voltage generator, a second input end of which is connected to the reference electrical potential point, and which outputs from an output end a second inverted and amplified signal obtained by inverting and amplifying the direct current bias voltage output from the direct  
20 current voltage generator;

25 a third operational amplifier, a first input end of which is connected in common to each of the output ends of the first and second operational amplifiers, a second input end of which is connected to the reference electrical potential point, and which inverts and amplifies a combined signal obtained by combining the first and second inverted and amplified signals and

outputs the inverted and amplified signal to another end of the second coil; and

first and second frequency characteristic compensating circuits connected between the reference electrical potential point and each of the first input end of the first and third operational amplifiers or between each of the first input end and the output end of the first and third operational amplifiers, the first and second frequency characteristic compensating circuits being adopted to compensate for a frequency characteristic so that a gain of each of the first and third operational amplifiers increases with a component having a higher frequency from among the low frequency bands of the input digital signal passed to the other end of the first coil.

17. The pulse pattern generator according to claim 16, characterized in that, when the first and second input ends of the first to third operational amplifiers of the digital signal offset adjusting apparatus are an inverted input end and a non-inverted input end, respectively,

each of the non-inverted input ends of the first to third operational amplifiers is connected to the reference electrical potential point,

25 an input matching resistor having a predetermined value is connected between the inverted input end and the reference electrical potential point of the first

operational amplifier,

first to third feedback resistors are connected, respectively, between the output end and the inverted input end of each of the first to third operational amplifiers,

a direct current inputting resistor having a predetermined value is connected between the inverted input end of the second operational amplifier and the direct current voltage generator,

10 first and second output matching resistors each having a predetermined value are connected, respectively, between the output end of each of the first and second operational amplifiers and the inverted input end of the third operational amplifier,

15 and

a third output matching resistor having the predetermined value is connected between the output end of the third operational amplifier and the other end of the second coil,

20 whereby an added and combined signal obtained by adding and combining the first and second inverted and amplified signals output from each of the output ends of the first and second operational amplifiers is output to the output terminal via the other end of the second coil from the output end of the third operational amplifier which inverts and amplifies the added and combined signal.

18. The pulse pattern generator according to  
claim 17, characterized in that the direct current  
inputting resistor connected between the inverted input  
end of the second operational amplifier and the direct  
5 current voltage generator has a value equal to a value  
of the second feedback resistor connected between the  
output end and the inverted input end of the second  
operational amplifier as the predetermined value, and  
the first and second frequency characteristic  
compensating circuits are composed of a capacitor and a  
10 resistor connected in series, respectively, between the  
reference electrical potential point and each of the  
inverted input end of the first and second operational  
amplifiers.

15 19. The pulse pattern generator according to  
claim 17, characterized in that the direct current  
inputting resistor connected between the inverted input  
end of the second operational amplifier and the direct  
current voltage generator has a value equal to a value  
20 of the second feedback resistor connected between the  
output end and the inverted input end of the second  
operational amplifier as the predetermined value, and  
the first and second frequency characteristic  
compensating circuits are composed of a serial circuit  
25 of a coil and a resistor connected between each of the  
output end and the inverted input end of the first and  
third operational amplifiers, respectively.

20. The pulse pattern generator according to  
claim 19, characterized in that the first and second  
frequency characteristic compensating circuits are  
compatible with the first and third feedback resistors  
5 connected between the output end and the inverted input  
end of each of the first and third operational  
amplifiers by a resistor of each of the first and  
second frequency characteristic compensating circuits,  
respectively, and are composed of a coil connected in  
10 series between each of the resistors compatible with  
the first and third feedback resistors and each of the  
inverted input ends of the first and third operational  
amplifiers.